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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/722,255	11/24/2003	J. Devin MacKenzie	KOV-015	6086

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THE LAW OFFICES OF ANDREW D. FORTNEY, PH.D., P.C.  
401 W FALLBROOK AVE STE 204  
FRESNO, CA 93711-5835

EXAMINER

TOBERGTE, NICHOLAS J

ART UNIT PAPER NUMBER

2823

DATE MAILED: 12/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/722,255	<b>Applicant(s)</b> MACKENZIE ET AL.	
	<b>Examiner</b> Nicholas J. Tobergte	<b>Art Unit</b> 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 19 October 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-81 is/are pending in the application.
- 4a) Of the above claim(s) 49-78 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10, 12-22, 30, 31, 42-46, 79 and 80 is/are rejected.
- 7) ☒ Claim(s) 11, 23-29, 32-41, 47, 48 and 81 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>6/12/05 11/24/03</u> .  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Election/Restrictions***

Applicant's election without traverse of Group I in the reply filed on 10/19/06 is acknowledged.

### ***Claim Rejections - 35 USC § 112***

Claim 44 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The specification does not contain any information regarding the "single tool" used in the fabrication, examining or testing, depositing and irradiating of the circuit elements. Simply speculating that a single tool could be used, does not enable one to put into practice such a device if it were to exist in the present invention. Furthermore, the Applicant states on page 18 of the present application: "a commercially important advantage of such a process and/or tool is that they are theoretically capable of producing circuit(s) and/or assemblies of circuits with 100% operational yield in a single operational step, before continuing on to subsequent fabrication or integration step(s)". The Applicant is admitting by saying "theoretically" that such a device does not yet exist. Therefore such a device would need to be disclosed in its entirety in order to enable one of ordinary skill in the art to execute the limitations in claim 44.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-10, 13-17, 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perry et al (US 2004/0079195) prior publication on 6/20/2002 under (WO 02/048432 A3).

Pertaining to claim 1, Perry teaches a method of repairing a circuit, comprising the steps of:

a) depositing a thin film composition comprising nanoparticles of at least one electrically functional material on or over a region of said circuit to be repaired such that said thin film composition contacts first and second elements of said circuit; and

b) irradiating at least a portion of the thin film composition with a wavelength of light for a length of time and at an intensity sufficient to convert said nanoparticles to an electronically functional film, fuse said nanoparticles or bind said nanoparticles to each other. [0107] [0142] [0196]. While Perry doesn't specifically state first and second circuit elements, the fact that Perry teaches circuit repair, implies that there are circuit elements in need of being repaired. It would have been obvious to one of ordinary skill in the art at the time the invention was made to understand that circuit repair in the

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context of the invention of Perry, would mean fusing together circuit elements using the metal nanoparticles containing precursors.

Pertaining to claim 2, Perry teaches the method of Claim 1 wherein said length of time is sufficient to convert said thin film composition into an electrically functional thin film.

**[0107]**. "Length of time is sufficient to convert" is overly broad in that it encompasses all time. Perry teaches that the entire process is completed.

Pertaining to claim 3, Perry teaches the method of Claim 1, wherein a source of said light comprises a laser. **[0107]**

Pertaining to claim 4, Perry teaches the method of Claim 1, wherein said nanoparticles comprise metal nanoparticles. **[0142]**

Pertaining to claim 5, Perry teaches the method of claim 1, wherein said composition further comprises a sensitizer configured to selectively absorb said wavelength of said light. **[0028-0029]**

Pertaining to claim 6, Perry teaches the method of claim 5, wherein said light has a bandwidth of 40 nm or less. **[0385]**

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Pertaining to claim 7, Perry teaches the method of claim 1, wherein said light consists essentially of infrared light with an emission maximum of from about 800 to about 850nm. **[0385] Teaches 760nm which is within the infrared spectrum.**

Pertaining to claim 8, Perry teaches the method of Claim 1, wherein said light has properties (Inherent, all light has "properties") and said wavelength has a penetration depth such that illumination intensity at an interface between said thin film composition and said first and second elements of said circuit is sufficiently high to convert said nanoparticles near the interface to an electronically functional film. Again, Perry teaches that the process is completed, meaning that the light is intense enough to convert the nanoparticles into the functional film to repair the circuit.

Pertaining to claim 9, Perry teaches the method of claim 8, but fails to intensity relationship, specifically greater than 25% of an incident intensity. However, given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved. See In re Aller, Lacey and Hall (10 USPQ 233-237) "It is not inventive to discover optimum or workable ranges by routine experimentation."

Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in

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a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Any differences in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. In re Merck & Co., 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicants have the burden of explaining the data in any declaration they proffer as evidence of non-obviousness. Ex parte Ishizaka, 24 USPQ2d 1621, 1624 (Bd. Pat. App. & Inter. 1992).

An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. In re Burckel, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

Pertaining to claim 10, Perry teaches the method of claim 1, but is silent on whether or not the wavelength of light is sufficiently low enough to prevent detrimental effects to said component or adjacent component. However, this is counterintuitive to the claimed invention and would have been obvious to one of ordinary skill in the art at the time the invention was made. The object of the present invention is to repair the circuit, not damage it further. This is simply optimization of an essential parameter. See the rejection of claim 9, case law, related to determining appropriate conditions.

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Pertaining to claim 13, Perry teaches the method of claim 1, further comprising the step of developing said irradiated thin film to remove non-irradiated portions or portions adjacent to the irradiated portion of the composition. **[0022] [0086-0087]**

Pertaining to claim 14, Perry teaches the method of Claim 1, further comprising, prior to said depositing step, the step of exposing the first and second circuit elements. If the circuits weren't exposed, there would be no way to perform the repair by the method taught by Perry. This requirement would have been obvious to one of ordinary skill in the art.

Pertaining to claim 15, Perry teaches the method of Claim 14, wherein said exposing step comprises laser ablation. The use of laser ablation to form patterns in semiconductor devices is well known to one of ordinary skill in the art. Perry references the use of laser ablation as a conventional prior art method in **[0006]**. While not specifically detailing its use to uncover damaged circuits, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a known process used in patterning metal layers in circuit devices.

Pertaining to claims 16 and 17, Perry teaches the method of claim 14, but fails to teach wherein prior to the depositing step and after the exposing step the surface of the circuit elements is prepared by cleaning. This would have been obvious to one of ordinary skill in the art at the time the invention was made. It is well known to those of ordinary skill,



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that contaminants in a semiconductor device can adversely affect the performance and reliability of the device. Cleaning and preparing surfaces between process steps and the formation of layers is well known in the art as a means to prevent these negative effects and improve reliability and performance.

Pertaining to claims 42-43, Perry teaches the method of claim 1, particularly the fact that the invention of Perry can be used to repair circuits. Perry fails to teach a step of examining or testing said circuit to find and/or locate a region needing to be repaired. However, this step would have been obvious to one of ordinary skill in the art at the time the invention was made. There would be no reason to invent a means of repairing a circuit, if there was no way of knowing if a circuit needed to be repaired. The testing of the circuits is implied by the fact that some are found to need being repaired. Also, regarding claim 43, if there are no circuits fabricated, then there are no circuits to repair. Since Perry teaches repairing circuits, then circuits are implied to be formed.

Claims 12, 79 and 80 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perry as applied to claim 1 above, and further in view of Kodas et al (US 2003/0161959).

Pertaining to claim 12, Perry teaches the method of claim 1, but fails to teach wherein said nanoparticles comprises a precursor to a dielectric film. Perry teaches metal nanoparticles in a precursor. Kodas teaches a dielectric precursor that comprises

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nanoparticles for use in the deposition of passive electronic features (such as circuits). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the dielectric precursor containing nanoparticles as taught by Kodas and apply it to the circuit repair technique taught by Perry. The motivation for this is because the precursor of Kodas has a low conversion temperature which would enable its use on a variety of temperature sensitive components such as organic and polymer substrates (See Abstract)

Pertaining to claims 79 and 80, see rejection of claim 12. Kodas teaches using a precursor with a low conversion temperature to form a thin film. Perry teaches laser irradiation.

Claims 18-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perry as applied to claims 1-10, 13-17 above, and further in view of Blalock (US 2004/0113243).

Pertaining to claims 18-22, Perry teaches the method of claim 1, but fails to teach covering the repair area with a coating, passivation, or capping material.

Blalock teaches that a passivation layer is deposited onto a semiconductor die as a protective film. **See Abstract**. Blalock also teaches that polyimide is "presently the most common type of polymer used to form passivation films" [0003]. Furthermore Blalock goes on to state that the polyimide precursors are cured using UV light [0004]

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(Note, that a UV laser is a well known source of UV light). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the teaching of Blalock with that of Perry because a passivation layer of polyimide material is commonly used as a protective film for a semiconductor device.

Claims 30 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perry as applied to claim 1 above, and further in view of Danese (US 6,457,478).

Pertaining to claims 30 and 31, Perry teaches the method of claim 1, but fails to teach the chamber used in the process. Danese teaches a method of UV treating an object, which includes an exhaust system which utilizes an inert gas to remove debris generated during the UV radiation step. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teachings of Danese with that of Perry in order to remove any contaminants from the processing environment.

#### ***Allowable Subject Matter***

Claims 11, 23-29, 32-41, 47, 48, and 81 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.


**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nicholas J. Tobergte whose telephone number is 571-272-6006. The examiner can normally be reached on Mon - Thur 7am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

NJT

  
MICHELLE ESTRADA  
PRIMARY EXAMINER